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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Claude Couture, *et al.*
Serial No. : 10/044,846
Filed : 11/09/2001
Group Art Unit : 1711
Examiner : Tran, Thao T.
Title : **CROSSLINKED POLYSACCHARIDE,
OBTAINED BY CROSSLINKING WITH
SUBSTITUTED POLYETHYLENE
GLYCOL, AS SUPERABSORBENT**
Confirmation No. : 7917
Last Office Action : July 15, 2005
Attorney Docket No. : CLWZ 2 00148

REPLY BRIEF UNDER 37 C.F.R. § 41.41

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Dear Sir:

This Reply Brief is in furtherance of the Examiner's Answer dated October 13, 2006, and the Amended Appeal Brief mailed to the U.S. Patent and Trademark Office on June 26, 2006.

Appellant files herewith a Reply Brief in connection with the above-identified application wherein claims 4-9 and 66-82 were finally rejected in the Final Office Action of June 13, 2005.

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Cathryn Terchek

Date: November 27 2006

Appellant confirms that there are no changes to Sections I-VI and VIII of Appellant's Amended Appeal Brief submitted June 26, 2006.

Claims 4-6 and 66-82 have been rejected as being anticipated by Qin *et al.* (US Pat. 5,550,189) under 35 U.S.C. § 102(b). Appellants respectfully traverse the rejection as follows.

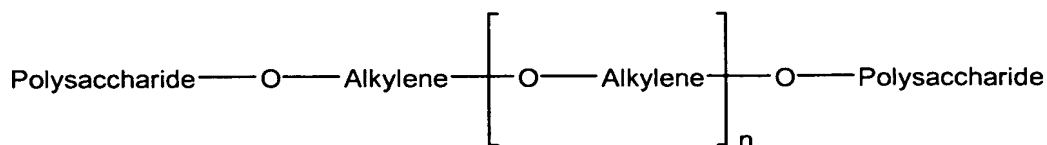
The Examiner's Answer mailed on October 13, 2006, did not take into consideration crucial arguments submitted by the Appellants.

A. BACKBONE INTERPRETATION

The following arguments, among others, were presented by the Appellants in the AMENDED APPEAL BRIEF mailed on June 26, 2006; in the previous REPLY BRIEF mailed on April 21, 2006; in the APPEAL BRIEF mailed on January 06, 2006; in the "RESPONSE/REQUEST FOR RECONSIDERATION" mailed on June 21, 2005; in the TELEPHONIC INTERVIEW held June 17, 2005 and in the "RESPONSE/REQUEST FOR RECONSIDERATION" mailed March 18, 2005.

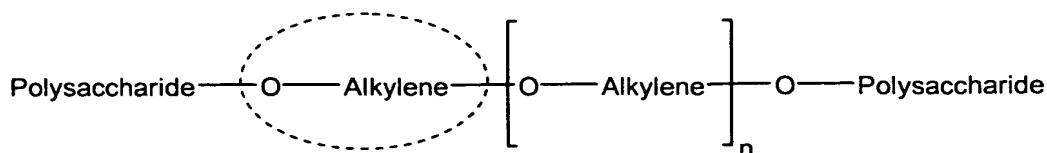
The "BACKBONE INTERPRETATION" argument should be addressed and construed separately from the "ESTER/ETHER" argument. Both arguments are distinct since both address separate parts of presently pending claim 4. More specifically, the "BACKBONE INTERPRETATION" argument is based on:

- The phraseology "wherein each Alkylene";
- The phraseology "wherein n is an integer ranging from 1 to 100"; and
- formula 2.



formula 2

Formula 2 should be construed as comprising a **poly**alkylene glycol backbone, not an alkylene glycol backbone. Indeed, as shown in formula 2, there is a static O-alkylene group, illustrated hereinbelow by a circled dashed line:



formula 2

Chemically linked to the static O-alkylene group is a repeating number of O-alkylenes, (inside the square brackets). These O-alkylene units are repeated “n” times. Since “n” is an integer ranging from 1 to 100, there is at least one (1) O-alkylene unit inside the brackets. Summing-up both the static part and the repeating part, there are always present in the backbone at least two (2) O-alkylene units:

$$1 \text{ STATIC O-alkylene} + 1 \text{ REPEATING O-alkylene} = 2 \text{ O-alkylenes}$$

Thus, if $n=1$, the polysaccharides are cross-linked by a dialkylene glycol backbone. A non-limiting example of such a dialkylene glycol is diethylene glycol. If $n=2$, the polysaccharides are cross-linked together by a trialkylene glycol backbone. A non-limiting example of such a trialkylene glycol is triethylene glycol. If $n=7$, the polysaccharides are cross-linked together by an octalkylene glycol backbone. A non-limiting example of such an octalkylene glycol is octethylene glycol.

The multiple nature of the O-alkylene unit should be even more obvious to the Examiner, considering that presently pending claim 4 comprises the wording “wherein each Alkylene”. According to Webster’s II College Dictionary 1999, “each” is defined as “*being one of two or more regarded individually*”.

It is thus respectfully submitted that the Board construe the backbone as defined in claim 4 as comprising two or more O-alkylene units.

In the Examiner’s Answer mailed October 13, 2006, the Examiner failed to fully consider this argument among others as presented by the Appellant in the “AMENDED APPEAL BRIEF” mailed June 26, 2006 as well as in the “RESPONSE/REQUEST FOR RECONSIDERATION” mailed on June 21, 2005. More specifically, on page 3 of the “RESPONSE/REQUEST FOR

RECONSIDERATION" it was pointed out by the Appellants that in the present invention *"The use of activated polyalkylene glycols to react with hydroxy groups on the polysaccharide results in a cross-linked backbone chain of atoms comprising repeating O-alkylene units, wherein the alkylene moieties are unsubstituted."*

This argument has been made several times to the Examiner without the Examiner fully appreciating how this differentiates the present claims from Qin. Specifically, a similar argument was previously presented in the telephonic interview on June 17, 2005 in which it was stated that *"Qin teaches an alkylene glycol as a cross-linking agent, whereas the presently claimed invention utilizes a polyethylene glycol".* In addition, this argument was previously presented in the "RESPONSE/REQUEST FOR RECONSIDERATION" mailed on March 18, 2005 in which the Appellant submitted that *"Qin et al. is silent about the use of activated polyalkylene glycols as cross-linking agents for polysaccharides. The use of such cross-linking agents results in a polysaccharide which is cross-linked by a backbone chain of atoms comprising repeating O-alkylene units, wherein the alkylene moiety is unsubstituted."*

In each case the Examiner failed to consider or simply chose to ignore that the present invention relates to a cross-linked polysaccharide comprising a polyalkylene glycol cross-linking backbone, as opposed to an alkylene glycol cross-linking backbone as disclosed by Qin. This results in distinct structural differences between the respective cross-linked polysaccharides.

The Appellants respectfully disagree with the Examiner's allegation that *"A product of Qin would at least read [on] the presently claimed structure when, for example, taking $n=1$."* Appellants respectfully submit that construction of presently pending claim 4 as hereinabove, if $n=1$, the backbone as defined in presently pending claim 4 will be:

Polysaccharide—O—alkylene—O—alkylene—O—Polysaccharide

Qin teaches ethylene or butylene glycol cross-linked polysaccharides. Such cross-linked polysaccharides inherently are of structure:

Polysaccharide—O—alkylene—O—Polysaccharide

In view of the above, the Examiner should clearly appreciate the crucial differences between the Qin backbone and the backbone as claimed in the Appellants' presently pending application. Qin teaches a *monomer* cross-linked backbone whereas the Appellants' application teaches a *polymer* cross-linked backbone. It is well known in the art that polymers and monomers have different characteristics. Appellant surprisingly discovered that polyalkylene glycol backbone cross-linked polysaccharides exhibit very high absorbent characteristics.

It is thus respectfully submitted that the Board construe the backbone as defined in claim 4 as comprising two or more O-alkylene units.

B. REACTIVITY OF STARCH

In the EXAMINER'S ANSWER mailed on October 13, 2006, as well as in the ADVISORY ACTION mailed on July 15, 2005, the Examiner alleges that "...the modified polysaccharide having unsubstituted OH groups would form ether linkages with the cross-linking agent" (the cross-linking agent being ethylene glycol). Moreover, the Examiner alleges that "...since Qin also discloses the same carboxyalkyl polysaccharide, i.e. carboxymethyl starch, and the same cross-linking agent, i.e. ethylene glycol, as presently claimed, the product of Qin would inherently be the same as presently claimed."

The Appellants have respectfully submitted on previous occasions that even if the degree of substitution in the modified polysaccharides as disclosed by Qin is low, it is well known by those skilled in the relevant art that the free hydroxyl functions of polysaccharides do not readily react with ethylene glycol or with any other polyol. The Examiner alleges that "...Qin discloses [that] the mixture of the carboxyalkyl polysaccharide, water, and the crosslinking agent can be made acidic by adding an acid, such as hydrochloric acid (see col. 14, ln. 12-23), which would make not only free carboxyl groups, but also hydroxyl groups in the polysaccharide and ethylene glycol more reactive."

The Appellants respectfully submit that the Examiner's assertion is incorrect based on an improper understanding of polysaccharide chemistry. The

Appellants respectfully submit that typical acidic conditions enabling a person skilled in the art to perform an etherification reaction between a pair of hydroxyl groups have not been disclosed by Qin. Moreover, it is well known in the art that polysaccharides will depolymerise under strongly acidic conditions. Strong acidic conditions are commonly used in processes encountered in the sweetener industry in which polysaccharides are broken down into their constituent monomers. Notwithstanding the observation that Qin broadly refers to acidic conditions, Qin is silent with respect to acidic conditions specific to performing an etherification reaction between a pair of hydroxyl groups. Moreover, the Appellants submit that typical acidic conditions that provide for an etherification reaction between a pair of hydroxyl groups to take place, would be detrimental to the integrity of the polysaccharide (*i.e.* resulting in the depolymerisation of the polysaccharide). The use of such harsh acidic conditions would in fact result in cross-linked monosaccharides, which, the Appellants respectfully submit, teaches away from the cross-linked polysaccharides as disclosed in the presently pending application.

C. CROSS-LINKING AGENT USED

In the EXAMINER'S ANSWER mailed October 13, 2006, as well as in the ADVISORY ACTION mailed on July 15, 2005, the Examiner alleges that "...*Qin also discloses the same carboxyalkyl polysaccharide, i.e. carboxymethyl starch, and the same cross-linking agent, i.e. ethylene glycol, as presently claimed, a product of Qin would inherently be the same as presently claimed.*" The Appellants respectfully disagree and submit that contrary to the Examiner's allegation, the present invention does not relate to cross-linked polysaccharides comprising a cross-linking backbone obtained by the use of a cross-linking agent such as ethylene glycol or butylene glycol. The Appellant respectfully submits that the cross-linking agents disclosed in the present application are activated polyalkylene glycols (see, *e.g.* paragraph 0038 of the presently pending application).

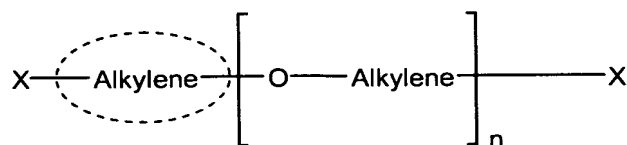
The Examiner should appreciate two (2) crucial differences between the cross-linking agent as taught by Qin and the cross-linking agent as taught in the Appellants' presently pending application. These two (2) differences, addressed and construed separately hereinbelow, are:

C1. Polymeric cross-linking agent

C2. Activation by means of a pair of leaving groups X

C1. POLYMERIC CROSS-LINKING AGENT

The cross-linking agents of Appellant's presently pending applications are defined in presently claim 74 and are represented hereinbelow by formula 2a.



formula 2a

The Examiner is directed to the similarities in the wording of presently pending claims 4 and 74. More specifically, claim 74 comprises the phraseology:

- "wherein each alkylene"; and
- "wherein n is an integer ranging from 1 to 100".

As previously discussed in point A hereinabove, and as can be clearly observed in formula 2a, the cross-linking agents as defined in presently pending claim 74 (*i.e.* "activated polyalkylene glycol") comprise a static alkylene unit (illustrated hereinabove by a circled dashed line). Moreover, the cross-linking agents as defined in presently pending claim 74 also comprise a repeating number of O-alkylenes (inside the square brackets). These O-alkylene units are repeated "n" times. Since "n" is an integer ranging from 1 to 100, there is at least one (1) O-alkylene unit inside the brackets. Summing-up both the static part and the repeating part, there are always present in the cross-linking agent, at least two (2) distinct alkylene units.

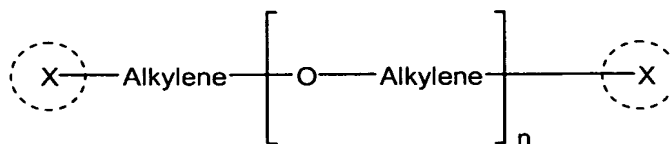
Thus, if $n=1$, the cross-linking agent is a bi-activated dialkylene glycol. A non-limiting example of such a bi-activated dialkylene glycol is 1,5-dichloro-3-oxopentane. If $n=2$, the cross-linking agent is a bi-activated trialkylene glycol. A non-limiting example of such a bi-activated trialkylene glycol is 1,8-dichloro-3,6-dioxooctane.

The multiple nature of the O-alkylene unit should be even more obvious to the Examiner, considering that claim 74 comprises the wording "wherein each alkylene". According to Webster's II College Dictionary 1999, "each" is defined as *"being one of two or more regarded individually"*.

It is thus respectfully submitted that the Board construe the cross-linking agent as defined in claim 74 (*i.e.* "activated polyalkylene glycol") as comprising two or more O-alkylene units. Contrary to the cross-linking agents of the presently pending application, the cross-linking agents as taught by Qin, (*i.e.* ethylene glycol or butylene glycol), do not comprise two (2) or more O-alkylene units.

C2. ACTIVATION BY MEANS OF A PAIR OF LEAVING GROUPS X

A further distinctive feature of the cross-linking agents as defined in claim 74 of Appellants' presently pending application, is the presence of a pair of leaving groups X (formula 2a). More specifically, the Examiner is directed to the phraseology *"wherein X is selected from the group consisting of halogen, mesylate, tosylate and triflate."*



formula 2a

The leaving groups X are subject to nucleophilic substitution (SN2). Under alkaline pH, the hydroxyl functions of polysaccharides will generate alkoxy (*i.e.* RO⁻) groups. These RO⁻ groups will react with the electropositive alkylene carbons bearing the leaving groups X, yielding the molecular backbone as claimed in presently pending claim 4.

The Appellants respectfully submit that the use of activated polyalkylene glycols as cross-linking agents has not been disclosed by Qin. The use of activated polyalkylene glycols as claimed in Appellants' presently pending application, inherently results in cross-linked polysaccharides that are structurally different from those disclosed by Qin *et al.* Accordingly, contrary to the Examiner's allegations, none of the cross-linked polysaccharides as taught in the presently pending application are taught by Qin.

The cross-linking agents disclosed by Qin *et al.* (*i.e.* ethylene glycol or butylene glycol) do not comprise leaving groups subject to nucleophilic substitution. Qin is silent with respect to any of the leaving groups (*i.e.* halogen, mesylate, tosylate and triflate) as taught by the Appellants' presently pending application. Finally, the cross-linking agents disclosed by Qin *et al.* are of a monomeric nature, contrary to the activated polyalkylene glycol cross-linking agents of Appellants' presently pending application.

D. Summary

In the present Reply Brief, the Appellants have once again underscored critical novelty imparting features not previously considered by the Examiner. For the Examiner's convenience, the Appellant has carefully construed presently pending claims 4 and 74 to illustrate these differences. The Appellants, by the present Reply Brief, submit that the backbone chain of atoms as defined in presently pending claim 4 will inevitably and always comprise at least two (2) distinct O-Alkylene units. This argument is rendered even more obvious considering the construction of the term "each" as used by the Appellants in presently pending claims 4 and 74. The Appellants again submit that **the teachings by Qin are silent with respect to a backbone comprising multiple O-Alkylene groups**. The Appellants' presently pending application thus relates to cross-linked polysaccharides comprising a cross-linker based on a polyalkylene glycol cross-linking backbone, as opposed to the alkylene glycol cross-linking backbones taught by Qin.

Moreover, the Appellants submit that Qin is silent with respect to acidic conditions specific to performing an etherification reaction between a pair of hydroxyl groups. Moreover, the Appellants submit that typical acidic conditions that provide for an etherification reaction between a pair of hydroxyl groups to take place, would be detrimental to the integrity of the polysaccharide (*i.e.* resulting in the depolymerisation of the polysaccharide). The use of such harsh acidic conditions would in fact result in cross-linked monosaccharides, which, the Appellants respectfully submit, teaches away from the cross-linked polysaccharides as disclosed in the presently pending application.

Yet moreover, the Appellants again submit that the cross-linking agents used to manufacture the cross-linked polysaccharide(s) as defined in presently pending claims 4 and 74, are neither disclosed nor hinted at by the teachings of Qin. The Appellants, by the present Reply Brief, submit that the use of the cross-linking agents as defined in presently pending claim 74 will inevitably and always provide a cross-linked polysaccharide having a backbone chain of atoms comprising at least two (2) distinct O-Alkylene units. This argument is rendered even more obvious considering the construction of the term "each" as used by the Appellant in presently pending claims 4 and 74. The Appellants again submit that **the teachings by Qin are silent with respect to a backbone comprising multiple O-Alkylene groups.**

Moreover, the Appellants again emphasize that the cross-linking agents used to manufacture the cross-linked polysaccharide(s) as defined in presently pending claims 4 and 74, comprise a pair of leaving groups X. These leaving groups are subject to nucleophilic substitution (SN2) and are selected from the group consisting of halogen, mesylate, tosylate and triflate. The Appellants again submit that **the teachings by Qin are silent with respect to the presence of leaving groups on the cross-linking agents that are subject to nucleophilic substitution.**

Finally, the Appellants submit that contrary to the Examiner's allegation, the presently pending application does not relate to cross-linked polysaccharides comprising a cross-linking backbone obtained by the use of a cross-linking agent such as ethylene glycol or butylene glycol or any other alkylene glycol. The Appellants respectfully submit that the cross-linking agents described in the presently pending application are activated polyalkylene glycols.

CONCLUSION

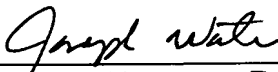
In view of the above, the Appellants respectfully submit that claims 4-9 and 66-82 are not anticipated or rendered obvious by the cited art.

Accordingly, it is respectfully requested that the Examiner's rejections be reversed.

Respectfully submitted,

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Dated: Nov 27, 2006



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